1		[$125 = ½\ 10t^2$	M1		For using $h = ½\ gt^2$
		$t = 5$ s	A1		
		[$s = 5 \times 5\ ½\ 0.8 \times 5^2$]	M1		For using $s = ut + ½\ at^2$
		Distance is 35 m	A1	4	
2	**(i)**	[$0.2g – T = 0.2 \times 1.6$]	M1		For applying Newton's 2nd law to B
		Tension is 1.68 N	A1	2	
	(ii)		M1		For applying Newton's 2nd law to A
		$T – F = 0.3 \times 1.6$	A1		
		Frictional force is 1.2 N	A1ft	3	ft T – 0.48
3	**(i)**	[$R + 0.6\sin\alpha = 0.5g\cos\alpha$]	M1		For resolving forces perpendicular to the plane
		Normal component is 4.63(2) N	A1	2	
	(ii)		M1		For resolving forces parallel to a line of greatest slope
			A1		
		$F + 0.6\cos\alpha = 0.5g\sin\alpha$			
		Frictional component is 0.824 N	A1	3	
	(iii)		M1		For using $\mu = F/R$
		Coefficient is 0.178	A1 ft	2	
4			M1		For resolving forces in the 'x' and 'y' directions
		$X = 12\cos25^\circ – 8\cos10^\circ$ (= 2.9972....)	A1		
		$Y = 12\sin25^\circ + 8\sin10^\circ – 2$ (= 4.4606....)	A1		
			M1		For using $R^2 = X^2 + Y^2$
		R = 5.37	A1		
			M1		For using $\tan\theta = X/Y$
		$\theta = 33.9$	A1	7	
5	**(i)**	[$5 = 2 + 0.05t$ or $25 = 4 + 2 \times 0.05(AB)$]	M1		For using $v = u + at$ or $v^2 = u^2 + 2as$
		Time taken is 60 s (or Distance is 210 m)	A1		
		Distance is 210 m (or Time taken is 60 s)	B1	3	
	(ii)	$s = kt^4/4$ (+C)	B1		
		$C = 0$ (may be implied by its absence)	B1		
		[$210 = k \times 60^4/4$]	M1		For using $s = 210$ when $t = 60$
		$k = 7/108000$ or 0.0000648	A1		
		Speed of Q at B is 14 ms^{-1}	B1ft	5	ft $k \times 60^3$

6	**(i)**	$\frac{1}{2} mv_B^2 = \frac{1}{2} mv_A^2 - mg \times 2.7$ and $\frac{1}{2} mv_C^2 = \frac{1}{2} mv_A^2 - mg \times 3$	M1 A1		For using the principle of conservation of energy from A to B or from A to C
		$[v_B^2 = 8^2 - 20 \times 2.7, v_C^2 = 8^2 - 20 \times 3]$ Loss of speed $= 10^{\frac{1}{2}} - 2 = 1.16$ ms^{-1}	M1 A1	4	For substituting for v_A to find $v_B - v_C$
	(ii)	Work done $= \frac{1}{2} 0.2 \times 2^2 + 0.2 \times g \times 3$ (= 6.4)	M1 A1		For using: WD against friction (C to D) = KE at C + loss of PE (C to D)
			M1		For using WD against friction (M to D) = KE at M + loss of PE (M to D)
		$\frac{1}{2} (0.4 + 6) = \frac{1}{2} 0.2v_M^2 + 0.2g \times 1.5$	A1		
		Speed at midpoint is 1.41 ms^{-1}	A1	5	
7	**(i)**	DF = 17280/12 (= 1440 N)	B1		
		[DF – R = ma ➔ 1440 – 960 = 1200a]	M1		For using Newton's 2nd law
		Acceleration is 0.4 ms^{-2}	A1	3	
	(ii)	[17280/V – 960 = 0]	M1		For using P/v – R = 0
		V = 18	A1	2	AG
	(iii)	For BC, –960 = 1200a (a = –0.8)	B1		
			M1		For using $0 = 18 + at$ and $0 = 18^2 + 2as$ for BC
		$t_{BC} = (0 - 18)/(-0.8)$ and $s_{BC} = (0 - 18^2)/(-1.6)$ (= 22.5 s and 202.5 m)	A1		
		Distance AB = 18(52.5 – 22.5)	B1		
		Distance is AC is 742.5 m	A1	5	Accept 742 or 743